American National Standard

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character structure and character parity sense for parallel-by-bit data communication in the american national standard code for information interchange

X3.25-1976

american national standards institute, inc.
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This standard has been adopted for Federal Government use.

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X3.25-1976
Revision of
X3.25-1968

American National Standard Character Structure and Character Parity Sense for Parallel-by-Bit Data Communication in the American National Standard Code for Information Interchange

Secretariat

Computer and Business Equipment Manufacturers Association

Approved June 25, 1976

American National Standards Institute, Inc

American National Standard

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Foreword

(This Foreword is not a part of American National Standard Character Structure and Character Parity Sense for Parallel-by-Bit Data Communication in the American National Standard Code for Information Interchange, X3.25-1976.)

This standard specifies the character structure and sense of character parity for parallel-by-bit, serial-by-character data communication in the American National Standard Code for Information Interchange, X3.4-1968 (ASCII), at the interface between data processing terminal equipment and data communication equipment. It also specifies the codes invoked when applying the American National Standard Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange, X3.41-1974.

This standard is one of a series developed by Task Group X3S3.3 on Data Communication Formats under the coordination of the X3S3 Subcommittee on Data Communications of American National Standards Committee on Computers and Information Processing, X3. Task Group X3S3.3, which was organized late in 1962 and held its first meeting in January 1963, is charged with the responsibility for standardizing character format, data transmission of characters within a hierarchy of groupings (that is, words, blocks, messages, etc) including group error control, and the order or sequence of bits within characters (including parity).

Other standards provide specifications for bit sequencing, formats for serial-by-bit, serial-by-character data transmission, and other parameters vital to the transmission of information between the types of equipment previously mentioned.

Suggestions for improvement of this standard will be welcome. They should be sent to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Computers and Information Processing, X3. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the X3 Committee had the following members:

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Contents

American National Standard Character Structure and Character Parity Sense for Parallel-by-Bit Data Communication in the American National Standard Code for Information Interchange

1. Scope

1.1 This standard specifies the character structure and sense of character parity for parallel-by-bit, serial-by-character data communication in the American National Standard Code for Information Interchange, X3.4-1968 (ASCII), and the codes invoked when applying the American National Standard Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange, X3.41-1974.

1.2 This standard applies to general information interchange at the interface between data processing terminal equipment (such as data processors, data media input-output devices, and office machines) and data communication equipment (such as data sets and modems).

2. Standard Character Structure

2.1 Seven-Bit Environment. The character structure shall consist of 8 bits, that is, 7 ASCII bits, b_1 through b_7, plus 1 character parity bit.

2.2 Eight-Bit Environment. The character structure shall consist of 8 bits, a_1 through a_8.

3. Standard Bit-to-Channel Relationship

3.1 Seven-Bit Environment. The 7 ASCII bits (b_1 through b_7) plus the character parity bit (P) shall be assigned to an ordered series of channel designators as follows: b_1 to the lowest designator and in ascending order, with P to the highest designator.

ASCII bit:	b_1	b_2	b_3	b_4	b_5	b_6	b_7	P
Channel:	1	2	3	4	5	6	7	8

3.2 Eight-Bit Environment. The 8 bits (a_1 through a_8) shall be assigned to an ordered series of channel designators as follows: a_1 to the lowest designator and in ascending order, with a_8 to the highest designator.

8-bit codes:	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8
Channel:	1	2	3	4	5	6	7	8

4. Standard Sense of Character Parity

4.1 Seven-Bit Environment

4.1.1 Where the transmission system is of the type where character timing is not separately signaled, the sense of the character parity shall be *odd*; that is, the parity bit for each character shall be such that there are an odd number of "1" (marking) bits in the character.

4.1.2 Where the transmission system is of the type providing character timing information by means of a separate timing channel, the sense of the character parity shall be *even*; that is, the parity bit for each character shall be such that there are an even number of "1" (marking) bits in the character.

4.2 Eight-Bit Environment. There is no parity bit in the 8-bit environment.

5. Revision of American National Standards Referred to in This Document

When the following American National Standards referred to in this document are superseded by a revision approved by the American National Standards Institute, Inc, the revision shall apply:

American National Standard Code for Information Interchange, X3.4-1968 (ASCII)

American National Standard Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange, X3.41-1974

Appendixes

(These Appendixes are not a part of American National Standard Character Structure and Character Parity Sense for Parallel-by-Bit Data Communication in the American National Standard Code for Information Interchange, X3.25-1976, but are included for information purposes only.)

Appendix A
Criteria

A1. Introduction

A1.1 This Appendix contains the criteria upon which the character structure, bit-to-channel relationship, and the character parity sense were based. Not all criteria have been entirely satisfied. Some of these criteria conflict with others, and the character structure and the character parity sense specified represent compromises among these divergent criteria.

A1.2 The criteria were drawn from communication aspects of information interchange as well as processing and media recording aspects of information interchange.

A2. Specific Criteria: Character Structure and Bit-to-Channel Relationship

NOTE: The following criteria are not mutually consistent and are not listed in order of importance.

A2.1 One hundred twenty-eight characters should be uniquely specified.

A2.2 A single character structure should be specified regardless of the transmission facility, speed, or modulation technique.

A2.3 No ASCII character should require special treatment.

A2.4 The highest possible character rate should be provided.

A2.5 The character structure for parallel-by-bit communication should be consistent with that for serial-by-bit communication.

A2.6 Each character should contain a single character parity bit.

A2.7 The character structure should cause minimum confusion to maintenance and operating personnel.

A2.8 Simple and economic means of error checking should be possible.

A2.9 The character structure should be independent of the transmission technique (for example, fixed or random character rates).

A2.10 The character structure should be independent of the existence of a timing channel.

A3. Specific Criteria: Sense of Character Parity

NOTE: The following criteria are not mutually consistent and are not listed in order of importance.

A3.1 No ASCII character should require special treatment.

A3.2 There should be no restrictions on sequences of characters (for example, successive Null, Sync, Space, Zero, or Delete characters).

A3.3 All characters in the ASCII should have the same parity sense (odd or even).

A3.4 The sense (odd or even) of the character parity bit should minimize hardware complexity.

A3.5 Maximum compatibility should be provided with the parity sense requirements of the various media.

A3.6 The sense of the character parity should be the same regardless of the data transmission technique, transmission facility, speed, or modulation technique.

A3.7 Equipment complexity should be minimized when alternately handling other codes or random binary data.

A3.8 The character parity sense should cause minimum confusion to maintenance and operating personnel.

A3.9 The character parity sense should not preclude any transmission techniques.

Appendix B
Design Considerations

B1. Introduction

System factors considered in this standard are transmission efficiency, reliability error control, media requirements, equipment complexity, maintenance confusion, and transition to and from alternate non-ASCII codes or random binary data.

B2. Character Structure and Bit-to-Channel Relationship

B2.1 The overriding consideration affecting the choice of character structure is compatibility with serial-by-bit data communication in order to minimize confusion. An 8-bit character structure (7 ASCII bits and parity) satisfies this requirement as well as all other criteria.

B2.2 The overriding consideration affecting the assignment of the bits to the channels is the need for a simple and orderly relationship. This requirement and all other criteria are satisfied by a b_1 to channel 1, b_2 to channel 2, etc, relationship.

B3. Sense of Character Parity

The choice of character parity sense, odd or even, involves a choice between clearly conflicting sets of criteria. Consistency with American National Standard Character Structure and Character Parity Sense for Serial-by-Bit Data Communication in the American National Standard Code for Information Interchange, X3.16-1976, cannot resolve this choice since that standard specifies even parity sense for asynchronous transmission and odd parity sense for synchronous transmission.

Essentially, the remaining criteria present a choice between:

(1) Media consistency with punched paper tape in such a way as to facilitate the use of the same equipment for handling binary data and other codes (argument for even parity)

(2) Providing the basis for recovery of character timing (that is, detecting character presence) from the data alone (argument for odd parity)

Since it is envisioned that one of these two considerations will become controlling in a distinct system, the standard sense of parity was chosen as different for the two types of systems based on presence or absence of a separate timing channel.

American National Standards on Computers and Information Processing

X3.1-1976 Synchronous Signaling Rates for Data Transmission

X3.2-1970 (R1976) Print Specifications for Magnetic Ink Character Recognition

X3.3-1970 (R1976) Bank Check Specifications for Magnetic Ink Character Recognition

X3.4-1968 Code for Information Interchange

X3.5-1970 Flowchart Symbols and Their Usage in Information Processing

X3.6-1965 (R1973) Perforated Tape Code for Information Interchange

X3.9-1966 FORTRAN

X3.10-1966 Basic FORTRAN

X3.11-1969 Specification for General Purpose Paper Cards for Information Processing

X3.12-1970 Vocabulary for Information Processing

X3.14-1973 Recorded Magnetic Tape for Information Interchange (200 CPI, NRZI)

X3.15-1976 Bit Sequencing of the American National Standard Code for Information Interchange in Serial-by-Bit Data Transmission

X3.16-1976 Character Structure and Character Parity Sense for Serial-by-Bit Data Communication in the American National Standard Code for Information Interchange

X3.17-1974 Character Set and Print Quality for Optical Character Recognition (OCR-A)

X3.18-1974 One-Inch Perforated Paper Tape for Information Interchange

X3.19-1974 Eleven-Sixteenths-Inch Perforated Paper Tape for Information Interchange

X3.20-1967 (R1974) Take-Up Reels for One-Inch Perforated Tape for Information Interchange

X3.21-1967 Rectangular Holes in Twelve-Row Punched Cards

X3.22-1973 Recorded Magnetic Tape for Information Interchange (800 CPI, NRZI)

X3.23-1974 Programming Language COBOL

X3.24-1968 Signal Quality at Interface between Data Processing Terminal Equipment and Synchronous Data Communication Equipment for Serial Data Transmission

X3.25-1976 Character Structure and Character Parity Sense for Parallel-by-Bit Communication in the American National Standard Code for Information Interchange

X3.26-1970 Hollerith Punched Card Code

X3.27-1969 Magnetic Tape Labels for Information Interchange

X3.28-1976 Procedures for the Use of the Communication Control Characters of American National Standard Code for Information Interchange in Specified Data Communication Links

X3.29-1971 Specifications for Properties of Unpunched Oiled Paper Perforator Tape

X3.30-1971 Representation for Calendar Date and Ordinal Date for Information Interchange

X3.31-1973 Structure for the Identification of the Counties of the United States for Information Interchange

X3.32-1973 Graphic Representation of the Control Characters of American National Standard Code for Information Interchange

X3.34-1972 Interchange Rolls of Perforated Tape for Information Interchange

X3.36-1975 Synchronous High-Speed Data Signaling Rates between Data Terminal Equipment and Data Communication Equipment

X3.37-1974 Programming Language APT

X3.38-1972 Identification of States of the United States (Including the District of Columbia) for Information Interchange

X3.39-1973 Recorded Magnetic Tape for Information Interchange (1600 CPI, PE)

X3.40-1976 Unrecorded Magnetic Tape for Information Interchange (9-Track 200 and 800 CPI, NRZI, and 1600 CPI, PE)

X3.41-1974 Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange

X3.42-1975 Representation of Numeric Values in Character Strings for Information Interchange

X3.44-1974 Determination of the Performance of Data Communication Systems

X3.45-1974 Character Set for Handprinting

X3.46-1974 Unrecorded Magnetic Six-Disk Pack (General, Physical, and Magnetic Characteristics)

X3.49-1975 Character Set for Optical Character Recognition (OCR-B)

X3.50-1976 Representations for U.S. Customary, SI, and Other Units to Be Used in Systems with Limited Character Sets

X3.51-1975 Representations of Universal Time, Local Time Differentials, and United States Time Zone References for Information Interchange

X3.52-1976 Unrecorded Single-Disk Cartridge (Front Loading, 2200 BPI), General, Physical, and Magnetic Requirements

X3.53-1976 Programming Language PL/I

X3.54-1976 Recorded Magnetic Tape for Information Interchange (6250 CPI, Group Coded Recording)

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